PG WHAT IS CLAIMS! ~~Claims~~

1. Method for the production and processing of alloyed casting material for the working area of indefinite chill rolls, containing the elements carbon, silicon, manganese, chromium, nickel, molybdenum, vanadium, and if applicable additional elements of group 5 of the periodic system, aluminum, and the remainder iron, accompanying elements, and impurities related to the manufacturing process, characterized in that

A. a melt is produced that has a chemical composition in wt-% of

2.0 to 3.5 C
1.0 to 2.0 Si
0.5 to 2.0 Mn
1.0 to 3.0 Cr
3.5 to 4.9 Ni
0.2 to 2.9 Mo

with the remainder iron and impurities, and

B. more than 0.5 % vanadium by weight in amounts up to 5.9 wt-% is added, is dissolved therein, and

C. the composition of the melt is set using alloying methods by fixing the concentrations of carbon and silicon in the presence of nickel and the effective total of the carbide forming elements in such a manner that, at its solidification, a microstructure is formed which exhibits 1.0 to 3.0 vol-% of graphite, with the guideline that more than 20 but less than 100 graphite particles are present per mm^2 of observed surface in a metallographic section and the remainder is composed primarily of martensite, 8 to 35 vol-% of eutectic carbides, and at least 1 vol-% of finely distributed vanadium carbides, after which

D. the melt is cast in a form, preferably a centrifugal casting mold, and is allowed to solidify into a body, preferably a working body of a roll, and optionally, the cast body is further processed, for example, into a composite roll, with the body or roll that has been produced in this manner being

E. subjected to a heat treatment including at least one one-time heating to a

treatment temperature, holding at this temperature, and cooling to room temperature.

2. Method according to claim 1, characterized in that the composition of the melt is set using alloying methods by fixing the concentrations of carbon and silicon in the presence of nickel and the effective total of the carbide forming elements in such a manner that, at its solidification, a microstructure is formed which has 1.0 to 2.5 vol-% of graphite, with the guideline that more than 22 and less than 100 graphite particles are present per mm^2 of observed surface in a metallographic section and the remainder is composed primarily of martensite, 10 to 25 vol-% of eutectic carbides, and of 2 to 20% of finely distributed carbides of the elements of group 5 of the periodic system.

3. Method according to one of claims 1 or 2, characterized in that the composition of the melt is set in such a manner that the concentration ratio of carbon to silicon is less than or equal to 2.6, preferably less than or equal to 2.0:

$C/Si \leq 2.6$, preferably = 2.0

4. Method according to one of claims 1 through 3, characterized in that the carbon content of the melt is set to a value of 2.2 to 3.1 wt-%, preferably 2.6 to 2.95%.

5. Method according to one of claims 1 through 4, characterized in that a final content of silicon of 1.2 to 1.85 wt-%, preferably 1.4 to 1.75%, is provided.

6. Method according to one of claims 1 through 5, characterized in that, when the composition of the melt is set using alloying methods, 0.002 to 0.65 wt-%, preferably 0.005 to 0.04 %, of aluminum is added and dissolved therein.

7. Method according to one of claims 1 through 7, characterized in that the nickel content of the melt is set to a value of 3.51 to 4.7 wt-%, preferably 4.15 to 4.6 wt-

%.

8. Method according to one of claims 1 through 7, characterized in that the composition of the melt is set in such a manner that the concentration ratio of molybdenum to chromium is less than 1.0, preferably less than 0.8:

Mo/Cr < 1.0, preferably < 0.8.

9. Method according to one of claims 1 through 8, characterized in that the content levels of chromium and molybdenum in wt-% of the melt are set to the values of

chromium 1.5 to 1.9
molybdenum 0.3 to 0.9.

10. Method according to one of claims 1 through 9, characterized in that 1.8 to 3.9 wt-% of vanadium, preferably 1.9 to 2.9 wt-%, is added to the melt and dissolved therein.

11. Method according to one of claims 1 through 10, characterized in that some of the vanadium is replaced by additional elements from group 5 of the periodic system in an amount of less than 0.6 wt-%, and mixed carbides are formed.

12. Method according to one of claims 1 through 11, characterized in that the cast body or the roll is subjected to a heat treatment which comprises heating from room temperature to a treatment temperature of 400 °C to 500°C, preferably 460 °C to 480 °C, holding at this temperature for at least two hours, preferably at least 8 hours, and cooling to room temperature, optionally with a low-temperature treatment.

13. Casting material for the working area of indefinite chill rolls, containing the elements carbon, silicon, manganese, chromium, nickel, molybdenum, vanadium, and the remainder iron, accompanying elements, and impurities related to the

manufacturing process, characterized in that the alloy contains, in wt-%, more than

0.5 to 5.9	vanadium
1.0 to 2.0	silicon
0.5 to 2.0	manganese
1.0 to 3.0	chromium
3.5 to 4.9	nickel
0.20 to 2.9	molybdenum
2.0 to 3.5	carbon with the guideline that
1.0 to 3.0	vol-% is present as graphite in particles with a distribution of more than 20 and less than 100 particles per mm^2 of polished surface of the material.

14. Casting material according to claim 13, characterized in that the alloy contains

1.8 to 4.9	wt-% vanadium
2.2 to 3.1	wt-% carbon with the guideline that
1.2 to 2.5	vol-% as graphite in particles with a distribution of more than 22 and less than 90 particles per mm^2 of polished surface.

15. Casting material according to claim 13 or 14, characterized in that the alloy contains, in wt-%,

2.0 to 3.5	carbon
1.0 to 2.0	silicon
0.5 to 2.0	manganese
1.2 to 2.5	chromium
3.5 to 4.9	nickel
0.5 to 2.1	molybdenum
1.5 to 4.9	vanadium

with the remainder iron and impurities.

16. Casting material according to one of claims 13 through 15, characterized in that

the alloy has a concentration ratio of carbon to silicon of less than or equal to 2.6, preferably less than or equal to 2.0:

$C/Si \leq 2.6$, preferably ≤ 2.0

17. Casting material according to one of claims 13 through 16, characterized in that the alloy contains 2.6 to 2.95% carbon by weight.

18. Casting material according to one of claims 13 through 17, characterized in that the alloy contains 1.2 to 1.85 wt-% of silicon, preferably 1.4 to 1.75%

19. Casting material according to one of claims 13 through 18, characterized in that the alloy contains 0.002 to 0.65 wt-% of aluminum, preferably 0.005 to 0.04 %.

20. Casting material according to one of claims 13 through 19, characterized in that the alloy contains 3.5 to 4.9 wt-% of nickel, preferably 4.15 to 4.6%.

21. Casting material according to one of claims 13 through 20, characterized in that the alloy has a concentration ratio of molybdenum to chromium of less than 1.0, preferably less than 0.8:

$Mo/Cr < 1.0$, preferably < 0.8.

22. Casting material according to one of claims 13 through 21, characterized in that the alloy contains in wt-%

chromium 1.5 to 2.01

molybdenum 0.3 to 0.9.

23. Casting material according to one of claims 13 through 22, characterized in that the alloy contains 1.8 to 3.9 wt-% of vanadium, preferably 1.9 to 2.95 wt-%.

24. Casting material according to one of claims 13 through 23, characterized in that some of the vanadium content is replaced by additional elements from group 5 of the periodic system in a proportion of less than 0.6 wt-%.

25. Casting material according to one of claims 13 through 24, characterized in that the material possesses, in vol-%,
8 to 35, preferably 10 to 25, eutectic carbides,
and 1 to 15, preferably 2 to 10, carbides of the elements of group 5 of the periodic system.

26. Composite indefinite chill rolls, especially for finishing stands of wide strip rolling mills and also Steckel and heavy plate mills, preferably produced using a method according to claims 1 through 12, comprising a work or sleeve part made of a casting alloy, preferably according to claims 13 through 25, with little tendency to adhere or weld to the rolling stock and with a high-strength core part made of ductile iron, characterized in that the working area or sleeve has a thickness of 10 to 150 mm and the sleeve material a structure composed essentially of 1.0 to 2.5 vol-% of graphite, with the latter being finely dispersed with a graphite particle count of more than 20 particles per mm^2 in a metallographic section, and of 8 to 35 vol-% of eutectic carbides, and of 1 to 20 vol-% of uniformly distributed vanadium carbide, with the remainder composed primarily of martensite and constituents related to impurities or the manufacturing process, and has a hardness between 70 and 90 ShC.

27. Composite indefinite chill roll according to claim 26, characterized in that the working area or sleeve material has a structure which has 1.0 to 2.5 vol-% of graphite, with the guideline that its distribution density is at least 22 particles but less than 100 graphite particles per mm^2 of polished surface in a metallographic section, contains eutectic carbides in an amount of 10 to 25 vol-%, and 2 to 10 vol-% special carbides of the elements of group 5 of the periodic system.

28. Composite indefinite chill rolls according to claim 26 or 27, characterized in that the working or sleeve material has a composition, in wt-%, of

C = 2.0 to 3.5, preferably 2.21 to 3.1, especially 2.6 to 2.95

Si = 1.0 to 2.0, preferably over 1.2 to 1.85, especially 1.4 to 1.75

Mn = 0.5 to 2.0, preferably 0.6 to 1.6, especially 0.7 to 1.4

Cr = 1.0 to 3.0, especially 1.5 to 2.01

Ni = 3.5 to 4.9, preferably 3.5 to 4.7, especially 4.15 to 4.6

Mo = 0.20 to 2.9, especially 0.3 to 0.9

Al = 0.002 to 0.65, preferably 0.005 to 0.1, especially 0.005 to 0.04

V = 0.5 to 5.9, preferably 1.8 to 3.9, especially 1.9 to 2.9

with the remainder being iron and impurities and the roll core is formed of ductile iron.

29. Composite indefinite chill rolls according to claim 26 through 28, characterized in that the working or sleeve material has, in wt-%,

V = 3.1 to 3.9, preferably 3.3 to 3.75 and

Nb+Ta = less than 0.6

with the remainder being iron and impurities.

30. Composite indefinite chill rolls according to one of claims 26 through 29, characterized in that the binding zone between the sleeve or working part and the roll core of low-alloy cast iron, preferably of ductile iron, has, in the radial direction, a bending strength (3-point bending test) of greater than 600 N/mm^2.